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NEMERTINA, MacLeay.

The *Nemertina* are white-blooded worms like some of the *Hirudina* or *Leeches*. In this group, however, the character of articulation becomes most indistinct. Rudolfi has placed *Gordius* along with *Nemertes* (Ent. Syst. 572.); and if *Gordius* goes into the group of *Nemertina*, it is possible that *Filaria* may also. *Nemertes Borlasii*, is a long black sea-worm, which is said to suck Testaceous *Mollusca*. The articulations of its body become visible when it is contracted. If the long vermiform impression in the Cambrian Rocks of Llampeter, Murch. Sil. Syst. Pl. 27. f. 4. belong to organic substances, it can only be referred to some animal between *Gordius* and *Nemertes*, although probably nearer the former genus. As yet, however, *Gordii* are only known to occur in fresh water, whereas this fossil production, if it belong to the animal kingdom, was evidently, like *Nemertes*, a native of the sea.

Genus NEMERTITES?

Animal marine, with the linear body, of a *Gordius* or *Filaria*.

Spec. 1. *Nemertites Ollivantii*. Murch. *n. s.* Pl. 27. f. 4.

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"*After a little while,*" he observes, "they perceived that one of these plants had changed the position of its leaves, and they at once suspected that it was an irritable plant which I had never mentioned in my lectures. I was in the botanic garden, which is contiguous to the public garden, at the time; they came and told me of this fact, which was not less new to me than to them. I went with them to the spot, and found that the plant was the *Oxalis stricta*. This is not mentioned in the list of species designated by authors as *sensitive*. I immediately repeated the experiment upon other individuals and obtained the same effect; but *it must be teased a long while, as its movements are much slower than those of the Mimosa pigra*. I suspect that if plants were observed with the requisite care, the phænomenon of irritability would not be so rare as is supposed. The irritability of the *Oxalis sensitiva* is already known. I have made experiments upon all those cultivated in our botanic garden, but I did not succeed in causing the position of the leaves to change. I believe that heat is the principal agent in this phænomenon, because even the *Hedysarum gyrans* slackens in its movements in autumn and during winter in hothouses. I should think that all the species of *Oxalis* are susceptible of contraction when irritated; but as most of them are natives of the Cape of Good Hope, it is possible that they show no effects from concussion in our climate, whose greatest heat never equals that of Africa. In the environs of Modena we have neither the *Oxalis acetosella* nor *Oxalis corniculata*, I have not therefore been able to make experiments upon them."

M. Morren in addition gives an account of some new observations which this communication had led him to make, and which proved to be in every respect confirmatory of the views of M. De Brignoli.

"The *Oxalis sensitiva* mentioned here by M. De Brignoli, and originally from China, was indeed named by M. DeCandolle from this fact Biophytum (*Biophytum sensitivum*); that is to say, *plant alive*; its leaves are pinnate like those of Sensitive plants. The East Indian *Averrhoa bilimbi* is another of the *Oxalideæ* in which the leaves are likewise excitable and mobile. The *Averrhoa carambola* has its petioles mobile, as

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Bruce has shown*. These approximations prove that the movement of the leaves of the true *Oxalides* may in fact extend to a multitude of species, since this genus is one of the most numerous†.

During the great heats of the month of June, when the thermometer was at + 35° (R.) in the sun, the excitability and movement of the leaves were very evident in our three indigenous species of *Oxalis*: *Oxalis acetosella*, *Oxalis stricta*, and *Oxalis corniculata*. When the sun darts his rays in the middle of the day directly on the leaves of these plants, their three obcordate leaflets are level, horizontal, and so placed that the margins which are directed towards the point of the heart, or towards the very short partial petiole, nearly touch one another; so that then there is, so to say, no space between the leaflets. This is the position of repose. Now if we strike the common petiole with light but repeated blows, or if we agitate by the same means the entire plant, we see, after the space of a minute,—less if it be very hot, more if it be cool,—three phænomena take place.

1. The leaflets fold themselves up along their midrib just like the moveable limb of the *Dionea muscipula*, in such a manner that their two halves approach each other by their upper surface; the movement therefore in this case is from below upwards, and it is a folding together.

2. Each lobe of the leaflet bends inwards, so that outwardly and on its lower surface it presents a convexity more or less decided. This is a movement of incurvation.

3. Each partial petiole, although very short, bends itself from above downwards, so as to cause the leaflets to hang downwards, which then nearly touch each other by their

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Of our three indigenous species, *stricta* and *corniculata* showed me these movements with the highest degree of energy, *Oxalis acetosella* has them less strong, but perhaps may have them as evidently when in flower, a time at which I have not observed it.

Every kind of exciting action provokes the same changes, as the wind, and especially a slight compression of the middle of the leaf, or of the place where the three partial petioles meet, between the thumb and fore finger.

In the botanic garden of the University of Liège I also observed two species with three folioles: *Oxalis purpurea* (W.), and *Oxalis carnosa* (Mol.). The first, when placed in a hothouse, showed the phænomena of excitability in the highest degree. The three folioles, without considerably bending back their lobes by the movement of incurvation already mentioned, curved downwards so as to touch one another two and two by the half of their limb, by placing their inferior surface one against the other.

Oxalis carnosa is more sluggish. The old leaves were motionless; the young ones, especially those which clothe the upper part of the stalk, exhibit nevertheless the same excitability, but the movement of incurvation is also less evident in it.

In a sixth trifoliate species, *Oxalis tortuosa*, the leaflets were no longer entire enough to enable me to ascertain if it were equally excitable.

*Oxalis Deppei**, furnished with four leaflets, evinces an excitability much more decided than the other species mentioned

* The *Oxalis Deppei* brought from Mexico to England in 1827, and figured by Mr. Loddiges in his 'Botanical Cabinet,' No. 1500, is the same species as that which has been described and figured by our learned colleague M. Lejeune in the Bulletin of the Academy, vol. ii. p. 334, 1835, by the name of *Oxalis zonata*. Known throughout England by its older name, I have thought it right to continue it. It is not from the Cape of Good Hope, but from Mexico.

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A leaf teratologically developed with five leaflets exhibited the same fact. It is unquestionably the species in which these movements can be best observed.

These were the only species which were at my command. In all of them the movement takes place without a shock, without agitation, but little by little, insensibly; it can, however, be ascertained all the better, as between a leaf the leaflets of which are horizontal, and another where they are vertical, the difference at once strikes the eye.

Our indigenous species are too small for observing the organs of this mobility well, but *Oxalis Deppei* is well calculated for observation and anatomy.

As in all plants moveable from excitation, the organs of motion reside in the apparatus itself which moves. Now here the apparatus consists of: 1. The blade itself of the leaf, an organ of incurvation; 2. The large midrib; 3. The partial petiole; the former being an organ for folding back, the latter an organ of incurvation.

Now the blade of the leaf is composed, above, of a cuticle with pinenchymatous cells, that is to say tabular-shaped (Meyen); beneath, of a cuticle with merenchymatous cells, swollen up, like bladders, with numerous small linear stomata between all the raised cells, so that one amongst them is often surrounded by six stomata; in the middle by a double diachyma, whose upper plane is formed of prismatic or ovoidal cells placed perpendicularly, and of such a size that upon the length of a single tabuliform cell of the upper cuticle (*derme*) there are six utriculi of the diachyma. The plane of the dia-

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above. In its ordinary state, the leaflets, all quite open, quite flat, spreading out upon the same plane, nearly touch at their margins, beginning from the reddish zone, which then seems to form a continuous circle on a deeply divided leaf. But if you have just given the petiole some gentle fillips, in a quarter or half a minute, when the sun shines upon the plant, you see the leaflets fold up along their midrib, from the base to the apex, then the two lobes curve inwards, and lastly the partial petiole bend from above downwards, so as to cause the leaflets to hang down. Two or three minutes after the fillips the plant seems to be asleep.

A leaf teratologically developed with five leaflets exhibited the same fact. It is unquestionably the species in which these movements can be best observed.

These were the only species which were at my command. In all of them the movement takes place without a shock, without agitation, but little by little, insensibly; it can, however, be ascertained all the better, as between a leaf the leaflets of which are horizontal, and another where they are vertical, the difference at once strikes the eye.

Our indigenous species are too small for observing the organs of this mobility well, but *Oxalis Deppei* is well calculated for observation and anatomy.

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chyma is formed of ovoidal cells, placed transversely, and of such a development that two of them are equal in diameter to a merenchymatous cell of the inferior cuticle which is equal to three or four fifths of a tabular cell of the superior cuticle.

It follows from this structure that the cells of the inferior mesophyllum are double the size of those of the upper mesophyllum. The diachyma is moreover very rich in chlorophyllum and in round clusters of crystals, occupying the axis of the cells.

It seems to me evident that analogy with the other plants which are moveable by excitation, should lead us to place the cause of the incurvation of the blade in the inferior mesophyllum, the cells of which by turgescence elongate the inferior pagina of the leaf, and thus cause the upper pagina or the mesophyllum to fold upwards. The cellular tissue is here also the essential organ of movement, and each cell a body turgescent by excitability.

The midrib is very large in this plant; it is three or four times larger than the secondary nerves, and it extends straight and rigid from the basis of the leaflet to its apex. It is transparent and juicy. This nerve reminded me of the structure which I discovered in former dissections in the *Dionæa muscipula*.

Its cuticle is formed of little cells as high as they are wide, nearly cubical, with very strong parietes. Four or five correspond in width to the diameter of a single infrajacent cell. Such a structure itself enables this cuticle to follow all the dilatations that its interior mass can undergo. Directly within this cuticle there occurs a cellular plane greatly developed, formed of large cells, irregularly merenchymatous, with strong parietes, and leaving between them passages, the section of which is a triangle. There is little chromule, but intracellular fluid in abundance. Each cell is the double of those of a more interior cellular plane, and the quadruple or the quintuple of those of the external cuticle. This plane of great cells has them four or five in a row. Then come towards the upper part of the midrib some chromuliferous cells, which immediately surround a channeled plane of vessels, a channel,

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the hollow of which is directed upwards, and which is filled with little cells and sap vessels.

This structure reminds us of that of the petiole of the *Mimosa pudica*. The distention of the great cells of the lower plane of the midrib must force the two half blades of the leaf to approach each other; and this enlargement, produced by excitability and allowed by the intercellular passages, thus becomes the proximate cause of the folding up of the two lobes of the leaflet of *Oxalis Deppei* all along the nervure. There is the same mechanism and a very analogous structure in the *Dionæa muscipula*.

There is no pulvinus at the base of the leaflets of the *Oxalis* as in the Mimosæ, but there is a peculiar organization in this part which answers the purpose of this organ. If we observe attentively how the leaflet is articulated to the petiole on the under side, we find that the midrib terminates in a crescent, the concave of which faces the petiole. The petiole in its turn ends in another crescent, the concave of which faces the leaflet; so that the partial petiole, which is so short as not to exceed a millimetre and a half, is terminated by two opposite crescent-shaped articulations, the convexities of which face each other. Thus much for the under part of the leaf.

As for the upper part, the two margins of the leaflet which converge at the base of the leaflet to form the point of the heart, become imperceptibly thicker and unite to form a kind of crescent-shaped bridle, whose concave is turned towards the leaflet. The common petiole receives in its turn the partial petiole by a crescent-shaped articulation, but which, in this instance, has its concave turned towards the leaflet, that is to say, it is a crescent parallel to the first. Between them spreads a red cuticle, which is strongly plaited crosswise.

The transverse section of this organ gives that of a depressed cylinder formed of a strongly resisting cuticle, consisting of ovoidal cells lying flatwise, the parietes of which are of the thickest. Then comes a fully developed layer of cellular tissue with cells plainly merenchymatous, forming at least a dozen rows. Each cell has a central mass of chromule. There are fewer rows of cells (from 8 to 9) towards the upper part of the partial petiole. In the centre of this, but a little higher

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than the geometric centre, are the air vessels (tracheæ) below, and the sap vessels above, surrounded by smaller and more fully coloured cells.

This organization is fundamentally that of the pulvinus of *Mimosa pudica*. When the merenchymatous cells of the cortical part of the lower zone are distended or turgescent, the leaflets are horizontal; when their turgescence stops and that of the cells of the upper zone predominates, the leaflets droop, as in the natural sleep of this *Oxalis*, and as takes place after it has been subjected to disturbance.

At any rate, the excitability of the cellular planes and of each cell in particular, and the distention which is the manifestation of it, must be admitted to account for the different positions which the leaves of the *Oxalis* take when they are struck.

The movement of the leaves of the *Oxalis*, although slower than that of the sensitive plants, is also not on that account less remarkable; it is even so much the more interesting to us, as, taking place in our indigenous plants, we can the better observe it; the physiological study of our national species hence obtains a new attraction, and the discovery of M. De Brignoli and his pupils has led in its turn to the discovery of an analogy of structure between the leaves of the Oxalideæ and those of the Mimosæ; an analogy which could hardly have been expected, but which is fully proved by direct observation.

The moveableness of *Oxalis* is the more singular, as M. De Candolle has not been able to modify the sleep of these plants, either by means of darkness or light, whence he concluded that the movements of sleep and awakening were connected with a periodical disposition of motion inherent in the plant*. We see, however, that a simple blow makes the *leaflets when awake* take the posture of *sleeping leaflets*.

M. Virey, in his 'Considérations nouvelles sur l'acidité dans les plantes irritables†,' has made evident by the recapitulation of the species in which the movement of any organ has been observed, that most of them were acid; this is indeed a curious analogy to demonstrate, but which proves nothing, for we cannot see what connexion there should be between a thing

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which is *acid* and a thing which *moves*. In relation to this M. Virey says that he knows no blue (alkaline) flowers in which there is any movement. We will name to him a blue flower, *Goldfussia anisophylla*, in which the style is one of the most mobile*. On the subject of these excitable plants, M. Virey has quoted our observations on *Stylidium graminifolium*†, but he makes us say things quite contrary to what we have written. Thus, we have nowhere said that the gynandric column of the Stylidieæ was articulated at its base by two opposite or antagonist fibres or muscles. Never should we have allowed ourselves to look upon vegetable fibres as muscles; we said (at pp. 15, 16, 17, and 18 of the memoir quoted) that these fibres exist all along the column, right and left. We never said that the column was irritable at its base, for it is not so; it is irritable at its *elbow*, and we have figured it five times: never did we say that we had found fecule in these muscles, as M. Virey asserts; quite otherwise; we wrote (p. 18) that the fibres had no influence on the movement, since when they were cut, the movement still took place. What is in our memoir is this: our idea is very clear; it is the feculiferous portion of the column which moves, and the same thing takes place in all the species of the genus *Stylidium*. This is an irrefragable fact; whether it agree or not with received theories, signifies little; in the natural sciences facts go before all things, and it is by them alone that we can attain to truth.

XLVIII.—*An attempt to ascertain the Fauna of Shropshire and North Wales.* By T. C. Eyton, Esq., F.L.S.

[Continued from vol. iii. p. 29.]

Additions to Vertebrata.

Vespertilio Nattereri, Kahl. (Reddish Grey Bat.) One specimen is in my possession, taken at Eyton.

Sorex araneus, Linn. Since the publication of the former portion of this series of papers, the discovery of the Rev. L. Jenyns, that this

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